

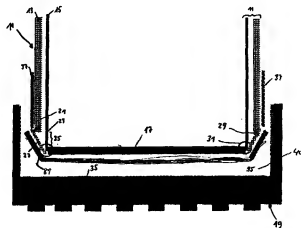
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(54) Title: WATERPROOF BREATHABLE FOOTWEAR WITH GASKET



(57) Abstract: Waterproof footwear is provided with an upper (11) and with a sole structure having an outsole (19), in which the upper is constructed with an outer material (13) and with a waterproof functional layer (15) that covers the outer material at least partially on its inside and has an upper end region on the sole side with an outer material end region (21) and a functional layer end region (23). The outsole (19) is joined to the upper end region. The functional layer end region has a projection (25) extending beyond the outer material end region (21). A spacer strip (27) is connected on one side to the outer material layer end (21) and on the other side to the functional layer end projection (23) or to the insole (17) such that it covers the projections. A gasket (89) is adhered to the underside of the insole (17) and to the outside of the spacer strip (27) in a manner which results in a waterproof zone at least in the area of the spacer strip (27); and an outsole (19) is adhered to said gasket (89) and to at least a portion of the outer material (13) end by an adhesive.

## TITLE OF THE INVENTION

### WATERPROOF BREATHABLE FOOTWEAR WITH GASKET

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#### RELATED APPLICATIONS

The present application is a regular application based on co-pending United States Provisional Patent Application 60/149,039 filed August 16, 1999.

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#### FIELD OF INVENTION

This invention relates to waterproof footwear, and its method of production. More particularly it relates to footwear that is liquid proof, but is water vapor permeable, and is desired to be close fitting as would be required for athletic, casual and other similar footwear applications that would use force lasting processes and cemented soles. The invention concerns footwear with an upper, provided at least partially with a durably waterproof functional layer that is preferably water vapor-permeable, and with an outsole, especially a glued-on outsole, and the use of a spacer strip and a gasket for sealing.

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#### Background

There are shoes whose shoe upper is waterproof and water vapor-permeable, owing to covering with a waterproof breathable functional layer. This type of shoe upper remains breathable, despite its waterproofness. Special efforts are required to ensure permanent waterproofness in the region between the end of the upper on the sole side and the sole structure.

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To achieve this, sock-like inserts, also called booties in technical circles, have been used between the upper and sole structure, on the one hand, and an inner lining, on the other. Since such booties are shaped by joining cutout parts, they need not have stitching holes. However, the use of booties is quite costly in manufacture, if the booties are to correspond to some extent to the corresponding shoe shape and achieve the desired fit.

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Another known method consists of sealing the bottom of the footwear and the insole and the lower region of the upper, covered with the functional layer and optionally stitched to an insole, with outsole material of a molded-on

outsole. However, it cannot be prevented that water will reach the end of the upper on the sole side and thus the end of the functional layer on the sole side, generally on the water-conducting outer material of the upper via capillary effects, and will reach via bridges, especially in the form of textile fibers on the cut edge of the end of the upper on the sole side, the generally very strongly water-absorbing inner liner situated on the inside of the functional layer.

This problem has been overcome in a sole structure known from EP 0 298 360 B1, in which the functional layer has a projection with respect to the outer material in the region of the end of the upper on the sole side, which is covered with a spacer strip from one side on the outer material and the other side on the functional layer, and is firmly stitched to the insole. The projection of the functional layer is sealed by the outsole material, which, during injection molding, in which it is liquid, penetrated the spacer strip. The spacer strip represents a barrier to water that penetrated to below the region of the end of the upper on the sole side covered by the outsole, especially when a monofilament spacer strip is involved, so that such water cannot penetrate to the cut edge of the functional layer on the sole side and thus not reach the inner lining of the footwear.

The spacer strip solution has proven successful. Since sealing of the end region of the functional layer on the sole side, in this case, presumes molding-on of an outsole, this known method is restricted to shoes with molded-on outsoles and cannot be used for shoes with glued-on outsoles. Therefore, it is not available for shoes of more elegant style.

Shoe designs are known, in which the functional layer also has a projection beyond the outer material in the end region on the sole side, in which, however, no spacer strip is present. In this case, the outsole material is molded directly onto the functional layer in the region of the projection. This method is also suited only for footwear with molded-on outsoles.

Shoe designs are known, in which the functional layer also has a projection beyond the outer material in the end region on the sole side, and in which the sole may be attached by cementing. However, no spacer strip is present. In this case, the upper and the liner are lasted to an insole board and the water proof seal is made with the use of a gasket or sealant. These constructions require the use of lasting machines and

conventional insole materials and are not preferred for these applications. If one attempts to sew these functional layer projections directly to the insole material and then to force last the upper there is a great tendency for the stitching to pull out of the functional layer, creating rework and inefficiency.

- 5 The described invention overcomes these problems and still allows durably waterproof seals to be formed with the use of a gasket followed by conventional sole cementing.

#### **Summary of the Invention**

- 10 With this invention, footwear is made available in which the upper end region on the sole side can be made permanently waterproof with any outsole with the least possible expense by force lasting.

- 15 In its broadest aspect, the invention is footwear comprising an upper, an insole and an outsole in which:

- the upper is comprised of an outer material layer and a waterproof functional layer that covers the outer material at least partially on its inside, and having an upper end region on the sole side that is comprised of an outer material layer end region and a functional layer end region, said functional layer end region having a projection extending beyond the outer material layer end region;

- said projection being attached to said insole;  
a spacer strip connected on one side to the outer material layer end and on the other side to the functional layer end projection or to the insole,

- 25 such that it covers the projections;  
a gasket adhered to the underside of the insole and to the outside of the spacer strip in a manner which results in a waterproof zone at least in the area of the spacer strip;  
30 said outsole adhered to said gasket and to at least a portion of the outer material end by an adhesive.

#### **Detailed Description of the Invention**

- Footwear according to the invention has an upper, a insole material, a  
35 spacer strip, and an outsole, in which the upper is constructed with an outer material and with a waterproof functional layer that at least partially covers the outer material on its inside, and has an upper end region on the sole side with an outer material end region and a functional layer end region. The functional

- layer end region has a projection that extends beyond the outer material end region. A spacer strip covers the area between the outer material end and the end of the functional layer end region which is attached to the insole material. A sealing zone is provided around the outer perimeter of the insole and the
- 5 inner perimeter of the upper end region and consists of the functional layer end region as a projection that extends beyond the outer material end region and the spacer strip. The spacer strip is positioned such that it has one side that is joined to the outer material end region, and its other side to the functional layer end region and the insole material, preferably by sewing with a strobel stitch.
- 10 The presence of the spacer strip allows a durably waterproof seal to be formed between the functional layer end region and the gasket, while also allowing the forces created during force lasting or string lasting to be transferred to, or be shared with the upper material, rather than being applied exclusively to the functional layer. This prevents the rework that is created by the stitching tearing
- 15 out of the functional layer during processing. The spacer strip is preferably an open mesh material formed from thermoplastic mesh materials, or textile, but could take any form including, staples, large loop or long stitches, or similar structures. The key attributes are to allow sufficient flow of the adhesive to allow a durably waterproof seal to be formed and to allow the transfer or sharing
- 20 of load between the upper material and the functional layer during force lasting. One form of the spacer strip is a mesh obtainable from Gebr Jaeger GmbH.

- A gasket is then applied to cover the sealing zone and optionally the insole material and to form a waterproof seal to the functional layer end region
- 25 (sealing zone) through the spacer strip and creates durable waterproofness. The outsole is joined to the upper end region, and in the case where the insole material is not covered by the gasket material the outsole is sealed to the gasket to complete the waterproofing of the shoe.

- 30 A gasket is provided that contains solid polymer resin on one side. The gasket is heated in an IR flash activator (infrared heater) or heat tunnel, such that the side with the polymer resin becomes tacky or molten. The gasket is then manually placed over the spacer strip. The gasket in the desired location is then placed into a press with the shoe so that it attaches itself to the
- 35 functional layer projection.

The gasket can be made of a multitude of backer materials that are coated with the polymer resin coating that preferably has a lower melting point

than the backer. The backer does not flow during the pressing step, but the polymer resin flows to provide a waterproof barrier. The backer should have some level of puncture resistance such that it does not get damaged during the pressing step. The polymer resin softens and flows during the pressing step and forms a seal to the functional layer projection and fills the spacer strip. The purpose of this step is to make the resin flow through the spacer strip and seal to the inner functional layer projection. After the desired dwell time has passed, the footwear is removed from the press. If the gasket covers the entire insole, the footwear is now waterproof because the waterproof gasket acts like a sole to seal off the bottom of the footwear. For durability, the sole is applied over this construction

The gasket adhesive need not be thermoplastic and could be a curing material that is capable of flow, but solidifies on curing, but thermoplastic materials are the preferred method of application. The adhesive can be polyurethane, polyethylene, silicone, epoxy, acrylic, latex, or thermoplastic elastomers or rubbers, provided they can form a seal to the projection and are flexible enough for this application.

The sealing function, which was achieved in ordinary footwear of the aforementioned type with the outsole material, is produced in the footwear according to the invention by heating or infra red (IR) flash activating the gasket material and flowing it through the spacer strip and bonding to the projection of the functional layer end region on the other side of the spacer strip, and leads to reliable waterproofness in the final shoe.. The adhesive or sealant that is part of the gasket is typically a thermoplastic urethane that is infra red (IR) flash activated or heated to be flowable, but can be any variety of materials that will function as adhesives and sealants.

The waterproofness of the sole structure of waterproof footwear is thus achieved in extremely simple fashion and with extremely simple process steps. The method according to the invention therefore leads to lower manufacturing costs for waterproof shoes.

Bonding and sealing of the gasket to form a seal is particularly intimate, if the activated (molten) adhesive of the gasket is pressed mechanically against the sole using a pressing device like a sole press that is preferably suitable for this purpose and available from USM, International. Similar equipment is

available from other footwear equipment manufacturers, and are well known in the industry.

In one variant of the invention, the upper end region extends essentially perpendicular to the bearing surface of the outsole (subsequently, also referred to as vertical extent) and the functional layer end region protrudes beyond the outer material end region in the direction toward the bearing surface. In another variant of the invention the upper end region extends essentially parallel to the bearing surface of the outsole (subsequently, also referred to as horizontal extent) and the functional layer end region protrudes beyond the outer material end region in the direction toward the center of the outsole. The first variant is particularly suited for shell-like outsoles that have an edge that protrudes perpendicular to the bearing surface of the outsole. The latter variant is particularly suitable for shoes with flat, plate-like outsoles, as are used in more elegant shoes, for example.

By force lasting is meant the generic term for constructions where the upper and insole is first sewn together to form a "bag" which is then manually pulled or forced over the last or foot form to give it the required shape (sometimes called "bag" lasting). There are many variants of force lasting.

Examples include: sewn-in-sock, tubular, moccasin, California slip last, veldtschoen, string lasted, side wall stitched, and turnshoe. Other examples and names are:

Strobel - the best known sewing machine manufacturer for force lasted sewn-in-sock work and hence the construction is commonly called Strobel construction.

Slip lasting - commonly used as an alternative term to force lasting, but implies relatively low forces are required to pull the upper over the last. Often used for the tubular construction with lightweight lining or insole.

The procedure is as follows in a method according to the invention to produce footwear according to the invention: An upper is created, which is constructed with an outer material and with a waterproof functional layer that covers the outer material at least partially on its inside, and is provided with an upper end region on the sole side. The functional layer is provided with a functional layer end region on the sole side, in which the functional layer end

region is provided with a projection that extends beyond the outer material end region. A spacer strip is attached between the upper end region and the end of the functional layer end region and insole material. The inside end of the spacer strip and functional end region is attached to the insole material typically by sewing with a strobil stitch. A sealing zone is defined in the outsole peripheral direction between the upper material edge and the insole material edge, which leads to waterproofness around the sealing zone and the perimeter of the insole when the gasket is fastened to, *the functional end region through the sealing zone. If the gasket material covers the entire insole material, the shoe is waterproof at this point. If the gasket chosen is of a nature that it is water proof and non wicking, and can form a waterproof seal with the sole during the cementing of the sole, then it may not be necessary to cover the entire insole material. It can be sufficient to seal the sealing zone around the entire periphery of the shoe, and then to form a durably waterproof seal to a waterproof outsole through the use of outsole cement and the use of a waterproof outsole.* If the gasket is in the form of a ring that only covers the sealing zone, waterproofness will be achieved when the soling adhesive is applied and forms a seal between the gasket and the outsole. *A series of staples or large loop stitches could also serve as the spacer strip described above if they are spanning the same region and allow load sharing with the upper. Typical temperatures for application of the gasket will be between 60 and 140°C, preferably between 80 and 120°C.*

Production of shoes according to the invention becomes particularly simple and economical due to the use commercially available gaskets, and outsole adhesives that are easily applied for sealing and sole attachment.

Activation temperatures for such outsole adhesives typically lie in the range from about 60 to 90°C.

A functional layer that is not only water-impermeable, but also water vapor-permeable, is particularly preferred. This permits production of waterproof shoes that remain breathable, despite waterproofness.

The functional layer, optionally including the seams provided on the functional layer, is considered "waterproof", if it guarantees a water penetration pressure of at least 0.13 bar. The functional layer material preferably guarantees a water penetration pressure of more than 1 bar. The water



penetration pressure is measured according to a test method, in which distilled water is applied at  $20 \pm 2^\circ\text{C}$  to a sample of  $100\text{ cm}^2$  of the functional layer with increasing pressure. The pressure rise of the water is  $60 \pm 1\text{ cm H}_2\text{O}$  per minute. The water penetration pressure corresponds to the pressure at which water first appears on the other side of the sample. Details of the procedure are stipulated in ISO Standard 0811 from the year 1981.

A functional layer is considered "water vapor-permeable" when it has a water vapor permeability number  $\text{Ret}$  of less than  $150\text{ m}^2 \cdot \text{Pa} \cdot \text{W}^{-1}$ . The water vapor permeability is tested according to the Hohenstein skin model. This test method is described in DIN EN 31092 (02/94) and ISO 11092 (19/33).

Whether a shoe is waterproof can be tested, for example, with a centrifuge arrangement of the type described in US-A-5 329 807. A centrifuge arrangement described there has four pivotable mounting baskets to hold footwear. Two or four shoes or boots can be tested simultaneously with it. Centrifugal forces that are produced by rapid centrifuging of the footwear are utilized in this centrifuge arrangement to find water-untight sites of the footwear. Water is filled into the interior of the footwear before centrifuging. An absorbent material, like blotting paper or a paper towel, is arranged on the outside of the footwear. The centrifugal forces exert a pressure on the water filled into the footwear, which causes the water to reach the absorbent material, if the footwear is not tight.

Water is initially filled into the footwear in this type of waterproofness test. In footwear with an outer material that does not have sufficient intrinsic rigidity, rigid material is arranged in the internal space of the upper for stabilization, in order to prevent collapse of the upper during centrifuging. Blotting paper or a paper towel, on which the footwear being tested is placed, is situated in the corresponding mounting basket. The centrifuge is then rotated for a specified period. The centrifuge is then stopped and the blotting paper or paper towel examined to see if it is moist. If it is moist, the tested footwear did not pass the waterproofness test. If it is dry, the tested footwear passed the test and is classified as waterproof.

The pressure that the water exerts during centrifuging depends on the effective shoe surface (sole inside surface), which depends on shoe size, the

weight of the amount of water filled into the footwear, the effect of centrifuge radius and the centrifuge speed.

Appropriate materials for the waterproof, water vapor-permeable functional layer include polyurethane, polypropylene and polyester, including polyether-ester and its laminates, as described in documents US-A-4,725,418 and US-A-4,493,870. However, expanded microporous polytetrafluoroethylene (ePTFE) is particularly preferred, as described in documents US-A-3,953,566 and US-A-4,187,390, and expanded polytetrafluoroethylene that is provided with hydrophilic impregnation agents and/or hydrophilic layers; see, for example, document US-A-4,194,041. Microporous functional layer is understood to mean a functional layer whose average pore size lies between about 0.2  $\mu\text{m}$  and about 0.3  $\mu\text{m}$ .

The pore size can be measured with the Coulter porometer (tradename), which is produced by Coulter Electronics, Inc., Hialeah, Florida, USA.

The Coulter porometer is a measurement device that provides automatic measurement of pore size distribution in porous media, in which the liquid displacement method (described in ASTM Standard E 1298-89) is used.

The Coulter porometer determines the pore size distribution of a sample by an increasing air pressure directed on the sample and by measurement of the resulting flow. This pore size distribution is a gauge of the degree of uniformity of the pores of the sample (i.e., a narrow pore size distribution means that there is a slight difference between the smallest pore size and the largest pore size). It is determined by dividing the maximum pore size by the minimum pore size.

The Coulter porometer also calculates the pore size for average flow.

By definition, half of the flow through the porous sample occurs through pores whose pore size lies above or below this pore size for average flow.

If ePTFE is used as functional layer, the gasket adhesive can penetrate the pores of this functional layer during the application process, which leads to mechanical anchoring of the gasket adhesive in this functional layer. The functional layer, consisting of ePTFE, can be provided with a thin polyurethane (PU) layer on the side with which it comes in contact with the gasket adhesive during the gluing process. When PU gasket adhesive is used in conjunction

with such a functional layer, not only mechanical bonding, but also chemical bonding occurs between the PU gasket adhesive and the PU layer on the functional layer. This leads to a particularly intimate gluing between the functional layer and the gasket, so that particularly permanent waterproofness is guaranteed.

Leather or a textile fabric are suitable as outer material. Textile fabrics can be, for example, woven, knitted, mesh fabrics, nonwovens or felt. These textile fabrics can be produced from natural fibers, for example, from cotton or viscose, from synthetic fibers, for example, from polyesters, polyamides, polypropylenes or polyolefins, or from mixtures of at least two such materials.

A liner material can be arranged on the inside of the functional layer, if desired. The same materials just mentioned for the outer material are suitable as liner material, which is joined to the functional layer, forming a functional layer laminate. The functional layer laminate can also have more than two layers, in which a textile backing can be found on the side of the functional layer facing away from the liner layer.

The outsole of the footwear according to the invention can consist of waterproof material, like rubber or plastic, for example, polyurethane, or from non-waterproof material, like leather assuming the non-waterproof material is provided with rubber or plastic coating that waterproofs the area contacting and sealing region and the entire side facing the insole. If the gasket covers the entire bottom of the insole, then it is not necessary for the outsole to be waterproof, or have a rubber or plastic coating.

The insole material of the footwear according to the invention can consist of any woven, non-woven, fiberboard, or mesh material that is appropriate as an insole material and compatible with strobil stitching. The preferred type of insole material is a non-woven type, and it is available from Texon as TL28FL, or is available from Bontex as a product named BONPEL-350.

The invention, as well as additional tasks and advantages, are now further explained with reference to variants. In the drawings, partly in a schematized cross sectional view and partly in a perspective sectional view:

- Fig. 1 shows in a cross sectional view a first variant of a shoe according to the invention with insole, vertical upper end region and vertical spacer strip;
- 5 Fig. 2 shows in a cross sectional view a second variant of a shoe according to the invention with insole, vertical outer material end region, horizontal functional layer end region and horizontal spacer strip;
- 10 Fig. 3 shows in a cross sectional view a third variant of a shoe according to the invention with insole, horizontal upper end region and horizontal spacer strip;
- 15 Fig. 4 shows a perspective sectional view of the third variant, still without outsole;
- Fig. 5 shows a view as in Fig. 4, but with outsole;
- 20 Fig. 6 shows a partially cutaway perspective view of an entire shoe according to the third variant;
- Figure 7 shows in a cross sectional view a third variant of a shoe according to the invention with insole, horizontal upper end region and horizontal spacer strip, and the gasket covers only the sealing region.
- 25

30 The terms vertical and horizontal are used below to describe the position of individual shoe components. This refers to the depictions in the figures. This corresponds to the idea that shoes, in most cases, are found with their outsole on a horizontal floor or other type of horizontal base.

35 Fig. 1 shows, in a strongly schematized cross sectional view, a first variant of a shoe according to the invention with an upper 11, which is constructed with an outer material 13 and a functional layer 15 that covers its inside. The functional layer 15 can be part of a functional layer laminate that has a functional layer and a liner layer on its inside. The functional layer 15 can also be provided with a textile backing (not shown) on its outside, facing outer

material 13. There are also variants, in which the functional layer and the liner are separate material layers.

Fig. 1 also shows an insole 17 and a shell-like, prefabricated outsole 19, which is constructed with rubber and/or plastic. The outer material 13 and the functional layer 15 have a vertically (i.e., perpendicular to the bearing surface of outsole 19) ending outer material end region 31 and functional layer end region 23. The functional layer end region 23 has a projection 25 relative to outer material end region 21. The projection 25 is spanned by a spacer strip 27. A first, top side of the spacer strip is stitched to the lower end of outer material end region 21 by means of a first seam 29. A lower, second side of spacer strip 27 is stitched both to the insole material 17 and to the lower end of the functional layer end region 23 by means of a Strobel seam 31.

A gasket 89 that leads to waterproofness in the final shoe is applied to the across the area defined bounded by the upper end region of the shoe. The gasket adhesive is remelted, for example, by heating, or IR activation, so the gasket adhesive penetrates spacer strip 27 and penetrates into the region of the projection 25 and forms a seal to the functional layer end. In the final step, outsole adhesive is applied to the outsole 35 and to the gasket 89 and the lower end region of the outer 21. After drying the adhesives are IR flash activated and bonded during the sole attachment process. The gasket 89 is preferably sized and applied in such an extent and amount that it also seals the cut edge of functional layer 15 on the lower end of functional layer end region 23. The region of insole 17 bordering the functional layer end region 23 is then preferably also sealed.

Water or other liquid that has penetrated along the water- or liquid-conducting outer material 13 to the lower end of outer material end region 21 cannot reach the inside of functional layer 15 and thus the inside lining of the shoe, because of this sealing with gasket 89.

Outsole adhesive 35, which can be an ordinary outsole adhesive in the form of an aqueous or solvent adhesive, e.g. Helmitin C2426 or Upaco 2441, or hot melt adhesive, is preferably applied to the entire inside of outsole 19. Outsole adhesive 37 is also applied to the outside of outer material that comes in contact with the outsole 13. Fig. 1 shows a manufacturing state of the shoe of the first variant before the outsole 19 is pressed upward against insole 17, in

order to glue it to insole 17 and to the upper end region on the sole side. The outsole adhesive 35 on the inside of shell edge 40 of outsole 19 then enters into adhesive bonding with the outsole adhesive 37 applied to the upper end region.

5           For better depiction and clarity in Fig. 1, the spacings between the individual components of the shoes structure are shown larger than they are in reality. The spacings between the individual components are actually dimensioned so that after pressing of outsole 19 onto insole 17, the shell edge 40 lies tightly against the outside of outer material 13 and is glued to the insole.

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The same also applies for all other variants depicted in the figures.

Fig. 2 shows a second variant of a shoe according to the invention that largely agrees with the first variant depicted in Fig. 1, but deviates from the first variant to the extent that only the outer material end region 21 ends vertically in the second variant, but the functional layer end region 23 ends vertically in the second variant, but the functional layer end region 23 ends horizontally, i.e., parallel to the bearing surface of outsole 19. The projection 25 of functional layer end region 23 and essentially also the spacer strip run horizontally.

15           Because of the horizontal extent of functional layer end region 23, the insole material 17 does not extend over the entire sole width of the shoe structure, but its peripheral edge has a spacing from the vertical part of upper 11. Otherwise, agreement exists with the first variant, so that with respect to additional aspects of the second variant, the comments made above concerning the first variant

20           are referred to.

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Fig. 3 shows a third variant of a shoe according to the invention, in which both the outer material end region 23 and the functional layer end region 23 run horizontally, which also leads, in this variant, to a roughly horizontal extent of spacer strip 27 and gasket. This shoe structure permits the use of a plate-like outsole 39, since, unlike in the first and second variants, no enclosure of a vertical end region of upper 19 by means of a shell edge or shell-like outsole is required. For this reason, any outsole can be used for the third variant, for example, a leather sole, as is desired for more elegant shoes.

30           Because of the exclusively horizontal trend of outsole 39, the outsole adhesive 37 applied to the outside of outer material 13 is applied to the horizontally running outer material end region 21.

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The third practical example depicted in Fig. 3 is shown in Fig. 4 in a partially cutaway perspective view, but still without outsole. This figure shows a last 41, over which the upper 11 is pulled. Deviating from Fig. 3, a separate liner layer 43 is shown in Fig. 4 on the inside of functional layer 15. Fig. 4 shows the shoe structure in a state in which the gasket 89 has only been applied to the bottom of spacer strip 27, but has still not been forced through spacer strip 27 to penetrate up the functional layer end region 23.

Fig. 5 shows a shoe structure according to Fig. 4, also in a partially cutaway perspective view, after gluing of an outsole 39 onto the bottom of the insole and onto the bottom of the vertical region of upper 11. The last 41 has already been removed from the shoe in this depiction.

A circular section of the sole structure is shown additionally in an enlargement for better clarity.

Fig. 6 shows in a perspective view an entire shoe, in which a part is cut away, in order to show the site of the shoe on which the section according to Fig. 5 is situated.

Fig. 7 also shows an insole 17 and a shell-like, prefabricated outsole 19, which is constructed with rubber and/or plastic. The outer material 13 and the functional layer 15 have a vertically (i.e., perpendicular to the bearing surface of outsole 19) ending outer material end region 31 and functional layer end region 23. The functional layer end region 23 has a projection 25 relative to outer material end region 21. The projection 25 is spanned by a spacer strip 27. The top side of the spacer strip is stitched to the lower end of outer material end region 21 by means of a first seam 29. A lower, second side of spacer strip 27 is stitched both to the insole material 17 and to the lower end of the functional layer end region 23 by means of a Strobel seam 31.

A gasket 89 that leads to waterproofness in the final shoe is applied only to the sealing zone on the inside edge of the upper end region of the shoe. The gasket adhesive is remelted, for example, by heating, or IR activation, and the gasket adhesive penetrates spacer strip 27 and penetrates into the region of the projection 25 and forms a seal to the functional layer end. In the final step, the outsole adhesive 35 & adhesive on the upper 37, seals this region by bonding to the gasket 89 during the sole attachment process. The gasket 89 is

preferably applied in such an extent and amount that it also seals the cut edge of functional layer 15 on the lower end of functional layer end region 23.

- 5 Water or other liquid that has penetrated along the water- or liquid-conducting outer material 13 to the lower end of outer material end region 21 cannot reach the inside of functional layer 15 and thus the inside lining of the shoe, because of this sealing with gasket 89.

- 10 Outsole adhesive 35, which can be an ordinary outsole adhesive in the form of an aqueous or solvent adhesive or hot adhesive, is preferably applied to the entire inside of outsole 19. Outsole adhesive 37 is also applied to the outside of outer material 13. Fig. 1 shows a manufacturing state of the shoe of the first variant before the outsole 19 is pressed upward against insole 17, in order to glue it to insole 17 and to the upper end region on the sole side. The  
15 outsole adhesive 35 on the inside of shell edge 40 of outsole 19 then enters into adhesive bonding with the outsole adhesive 37 applied to the upper end region.

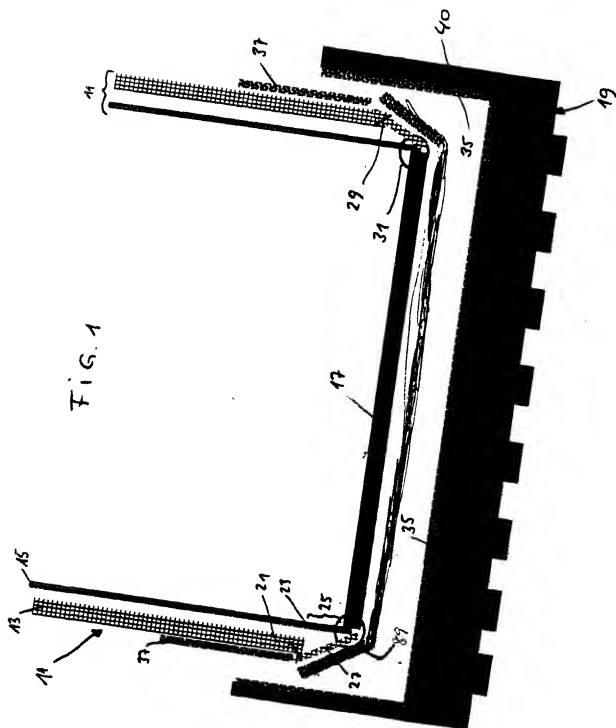
- For better depiction and clarity in Fig. 7, the spacings between the individual components of the shoes structure are shown larger than they are in  
20 reality. The spacings between the individual components are actually dimensioned so that after pressing of outsole 19 onto insole 17, the shell edge 40 lies tightly against the outside of outer material 13 and is glued to the insole.



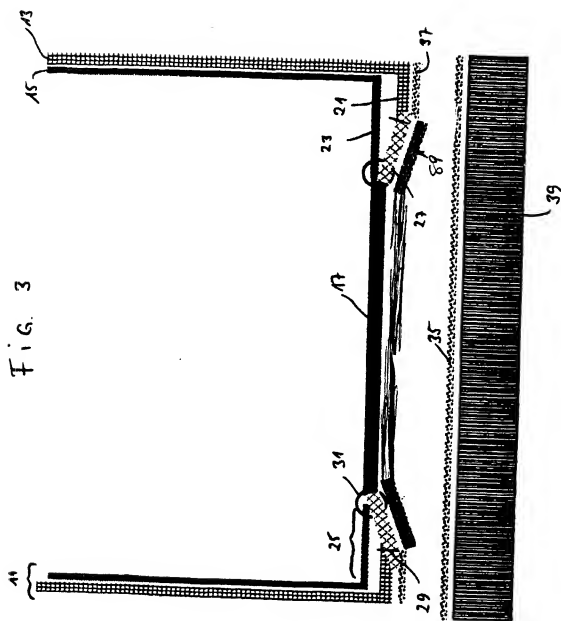
## Claims

1. Footwear comprising an upper, an insole and an outsole in which:  
the upper is comprised of an outer material layer and a  
5 waterproof functional layer that covers the outer material at least  
partially on its inside, and having an upper end region on the sole side  
that is comprised of an outer material layer end region and a functional  
layer end region, said functional layer end region having a projection  
extending beyond the outer material layer end region;  
10 said projection being attached to said insole;  
a spacer strip connected on one side to the outer material layer  
end and on the other side to the functional layer end projection or to the  
insole, such that it covers the projections;  
a gasket adhered to the underside of the insole and to the  
15 outside of the spacer strip in a manner which results in a waterproof  
zone at least in the area of the spacer strip;  
said outsole adhered to said gasket and to at least a portion of  
the outer material end by an adhesive.
- 20 2. The footwear of claim 1 wherein the gasket extends over the entire width  
of the insole and spacer and provides a waterproof zone over the entire  
area.
3. The footwear of claim 1 wherein the gasket covers the spacer but not  
25 the insole; and the insole is waterproof.
4. Footwear according to claim 1, 2, or 3 in which the upper end region  
extends substantially perpendicular to the bearing surface of the outsole  
and the functional layer end region extends beyond the outer material  
30 end region in a direction toward the bearing surface.
5. Footwear according to claims 1, 2, or 3, in which the upper end region  
extends substantially parallel to the bearing surface of the outsole and  
the functional layer end region extends beyond the outer material end  
35 region in a direction toward the center of the outsole.
6. Footwear according claims 1, 2 or 3, in which the insole is attached to  
the functional layer end region by a strobil stitch.

7. Footwear according to claim 1, 2, or 3 in which the spacer strip is stitched to the outer material end region and to the functional layer end region.
- 5 8. Footwear according to claims 1, 2 or 3 in which the functional layer is waterproof and water vapor-permeable.
9. Footwear according to claim 8, wherein the functional layer comprises expanded porous polytetrafluoroethylene.
- 10 10. Method for producing footwear which comprises:
- providing footwear that has an upper and insole;
- said upper comprised of an outer material layer and a waterproof
- 15 functional layer that covers the outer material at least partially on its inside, and having an upper end region on the sole side that is comprised of an outer material layer end region and a functional layer end region, said functional layer end region having a projection extending beyond the outer material layer end region,
- 20 attaching a spacer strip to the upper material end and to the end of the projection on the functional layer end, or to the insole,
- applying a gasket to the insole which gasket extends over the spacer,
- applying an outsole to the gasket using an adhesive.
- 25









517 FIG. 5

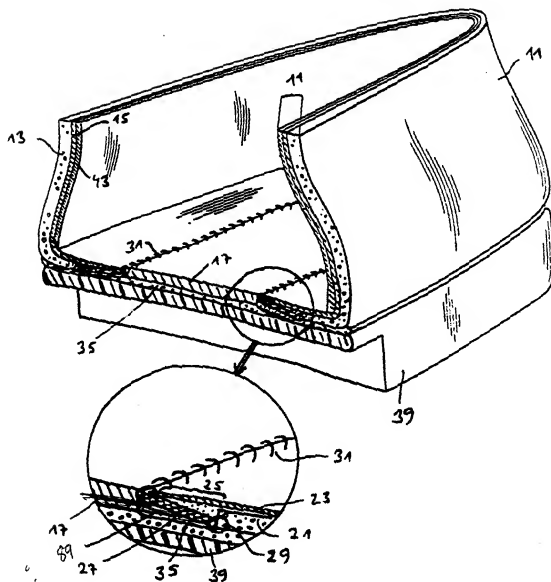
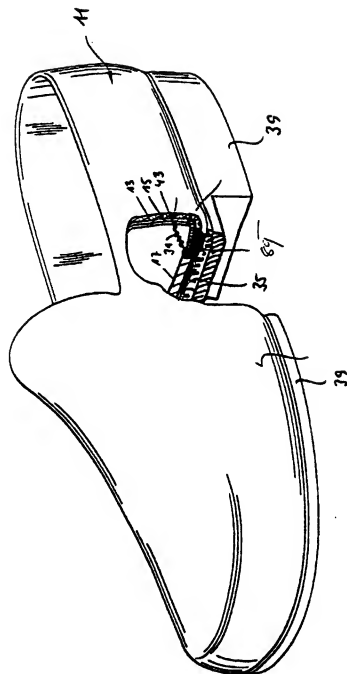
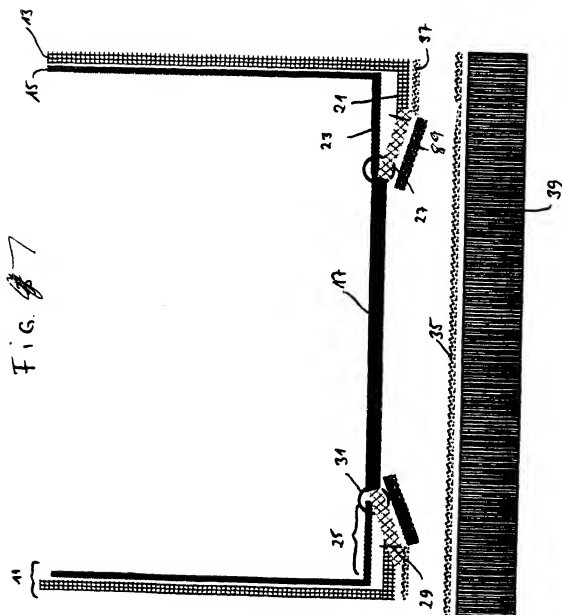


FIG. 6







# INTERNATIONAL SEARCH REPORT

		Int. Appl. No. PCT/US 00/22420	
<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC 7 A43B/12 A43B9/12			
According to International Patent Classification (IPC) or to both national classification and IPC			
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC 7 A43B			
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched			
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) PAJ, EPO-Internal, WPI Data			
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>			
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	
P,X	WO 00 24282 A (GORE W L & ASS GMBH ;HAIMERL FRANZ XAVER (DE); MEINDL ALFONS (DE)) 4 May 2000 (2000-05-04) claim 1	1,3-5	
Y	US 4 899 465 A (BLEIMHOFFER WALTER ET AL) 13 February 1990 (1990-02-13) cited in the application claims 1-3,11,20	1,2,7-10	
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	--- -/-		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.			
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (see specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "Z" document member of the same patent family			
Date of the actual completion of the international search  30 October 2000		Date of mailing of the international search report  07/11/2000	
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentstein 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer  Claudel, B	

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 00/22420

## C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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